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# Industrial Facilities, Public Parks and Community Composition: Examining Environmental Justice in Lincoln, Nebraska

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# INDUSTRIAL FACILITIES, PUBLIC PARKS AND COMMUNITY COMPOSITION: EXAMINING ENVIRONMENTAL JUSTICE IN LINCOLN, NEBRASKA

by

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# INDUSTRIAL FACILITIES, PUBLIC PARKS AND COMMUNITY COMPOSITION: EXAMINING ENVIRONMENTAL JUSTICE IN LINCOLN, NEBRASKA

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Abstract:

Environmental injustice involves the discrimination of low-income or minority populations in regards to environmental conditions in comparison to society at large. This study uses the net-environmental equity concept to analyze the state of environmental justice in the city of Lincoln, Nebraska. To what extent are Lincoln's environmental burdens located around low-income/minority residents? To what extent are Lincoln's environmental benefits located away from low-income/minority residents? To what extent do Lincoln's policies promote environmental justice? A distributional analysis of Lincoln's public park system and toxic releasing industries is completed along with a policy review. Lincoln's policies and environmental conditions of minority residents evidence no issues of environmental injustice. Environmental justice issues are evidenced for Lincoln's low-income populations regarding unequal distribution of industrial facilities.

## INTRODUCTION

The groundbreaking research by Robert Bullard (1990) brought attention to the disproportionate extent to which minorities have been impacted by environmental problems. In his study of Houston, Texas he found that even though African Americans made up twenty-five percent of the population, one hundred percent of city-owned landfills were located in predominantly African American neighborhoods. He expanded his study to Dallas, Louisiana, Alabama, and West Virginia and was able to conclude our nation's environmental laws, regulations, and policies are not applied fairly across all segments of the population causing low-income and minority communities to bear a disproportionate burden of environmental problems compared to society at large. These problems often threaten public health and safety of the communities affected (Crowder, 2010).

In 1983 a U.S General Accounting Office study of hazardous waste landfill siting found a strong relationship between the location of off-site hazardous waste landfills and the race and socio-economic status of the surrounding communities. Industrial processes such as incineration for waste disposal cause toxic chemicals like dioxin, lead, and mercury to be released into the environment; affecting the surrounding environmental conditions and thus the well-being of the surrounding population (Bullard, 1994). The United Church of Christ Commission for Racial Justice (1987) conducted the first national study on the topic of toxic waste siting. Their research found race to be the most important factor in the location of abandoned toxic waste sites throughout the country.

Consideration of these issues led to the development of the environmental justice movement (EPA, 2013). The movement is focused on targeting the disproportionate enforcement, submission and policy formulation as they affect environmental decisions. These

environmental decisions involve any potential change to environmental conditions from industrial pollutants to transportation services. The Environmental Protection Agency (2013:3) defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." The agency indicates that environmental justice will be achieved only "when everyone enjoys the same degree of protection from environmental health hazards and equal access to the decision-making process to have a healthy environment (2013:3)" Environmental justice issues concern cases where environmental activities, policies, burdens and benefits impact population groups (racial, economical, ethnic, geographic) differently (Rhodes, 2002). The movement expands the definition of environment beyond the physical and natural world to include where we live, work and play and promotes the focus on societal issues in order to solve our world's environmental problems.

The purpose of this study is to determine the extent to which environmental justice issues exist in the city of Lincoln, Nebraska. Now at nearly 17%, Lincoln's minority population recently surged from 25,000 in 2000 to almost 45,000 in 2010. Lincoln also has a growing portion of low-income residents. Lincoln's poverty rate is 16% placing the city above Nebraska and national poverty averages. As the city's diversity increases so does the potential of environmental equity issues. Are the city's growing concentrations of minority and low-income populations facing unequal amounts of environmental burdens or benefits? What policies exist in Lincoln that affect environmental justice throughout the city? The findings will help determine if future initiatives should be taken to improve or maintain the cities current environmental justice

and will add to the environmental justice framework by producing a city wide net environmental equity analysis.

First a literature review is provided focused on previous studies that have attempted to discover problems of environmental justice in a city or county community noting techniques and reasoning behind what they found. The research conducted is based on the net-environmental equity concept: assessing a communities environmental burdens, benefits and policies for a holistic view of an area. First the equal distribution of Lincoln's environmental burdens is evaluated through a demographic analysis of communities around toxic release sites found in the city. Next, the equal distribution of and level of access to Lincoln's environmental benefits is evaluated through a demographic analysis of communities around Lincoln city public parks and total parkland throughout the city's variously populated areas. Lastly Lincoln's laws, history and city planning documents are evaluated to assess the ramifications of these policies have toward the environmental justice of the city. The findings may lead to policy recommendations or further research into the impacts or causes of environmental discrepancies in Lincoln.

## LITERATURE REVIEW

The environmental justice movement prompted considerable research in the 1980's and 1990's which proved adverse environmental conditions for minorities and low-incomes especially in regards to overt racial discrimination in city zoning and industrial districts (Pollock, 1995). This prompted the federal government to pass several initiatives including the creation of the Office of Environmental Justice and Executive Order 12898, which forced integration of environmental justice concerns into federal agency decision-making and the EPA's environmental justice case strategies. These greatly reduced the instances of environmental injustice throughout the United States. However evidence of discrepancies between social and

racial groups remain prevalent in environmental justice case studies (Shrader-Frechette, 2002). The literature review focuses on previous environmental justice research with potential applications towards the study at hand. It will be focus on what has been found about environmental burdens, environmental benefits and governmental policy impact on minority or low-income communities.

*Burdens*

The framework for studies of environmental burdens began with studies by Robert Bullard (1994) where he determined institutional racism to be a factor in the siting of municipal and hazardous waste disposal facilities. The study of distributional patterns and regulations of pollutant forming industries (e.g. disposal facilities, landfills) comprises the majority of environmental justice research. The literature has found hazard presence to be consistently associated with income in the expected direction: as incomes decrease environmental hazard presence increases (Downey et al, 2010). Szasz, et al (1997) found the same relationship to be consistent throughout research, the poorer the neighborhood, the more polluted the air. A study of toxic storage and disposal facilities (TSDFs) in Los Angeles County compared the census tracts within a quarter-mile of TSDF to those farther away and found the distribution is inequitable with eighty-one percent minority population in tracts within a quarter mile and fifty-six percent minority population in other tracts (Pastor, 2001). Pastor's study also addressed the common question in environmental justice research of, which came first, the minority/poor population or the environmental burden placement? To address this he determined the dates of siting for all high-capacity TSDFs in Los Angeles County merged the information with a database that tracked neighborhood-level demographic and economic variables from 1970- 1990, and compared areas prior to siting and after siting. He found that most TSDFs were placed when

a high amount of minorities lived there and that racial make up of a given tract matters in the placement of TSDFs. His study is important to the research at hand because it points out the necessity of considering residential choice restrictions in the movement patterns of minority or low-income people in relation to the proximity to toxic storage and disposal facilities.

So we know environmental justice research can start with selecting a low-income or minority population and then searching for environmental burdens. But there is also research that locates environmental burdens and studies the populations around them searching for discrepancies. There has been considerable research using Toxic Release Inventory (TRI) data (Pollock et al 1995, Bowen et al, 1995, Glickman et al, 1995) and demographics of proximity to the releases to locate environmental justice issues. TRI reports are a product of the U.S EPA, which require large manufacturing, coal/oil electricity generation, mining, hazardous waste management and federal facilities to report their toxic release information annually. TRI documents over 300 toxic substances that are potentially released by the facilities into the air, land or water (EPA, 2013). Glickman et al (1995) examined proximity to TRI facilities by drawing circles with radii of .5 and 1.0 miles around facilities, compared the percentages of social categories (African Americans, all the poor, poor African-Americans, poor whites) within the circles to percentages of those found outside the circles and found higher amounts of poor people located within 1 mile of facilities when compared to other areas not in the 1 mile radius. Gaither (2014) used TRI industrial site data and found that both Blacks and Latinos are overrepresented in census block groups within 1 mile of industrial facilities.

Research by Crowder et al, (2010) combined data from the Panel Study of Income Dynamics with TRI data from the EPA to determine sources of environmental inequality at the individual level. The study also found racial differences in proximity to industrial pollution and

exposure to TRI facilities can negatively affect well-being, educational success, social order and local economic activity. They promoted TRI data as the "most comprehensive and detailed, publicly available national record of industrial facility activity available to researchers." In general studies that use distance-based methods to compare the demographics nearby (TRI, TDSFs) residential populations to demographics of populations farther away are best able to match environmental burdens to population attributes (Konisky, et al 2010, Rhodes, 2002).

*Benefits*

The majority of environmental justice literature is focused on sources of environmental burdens including toxics and other pollution and areas with high-minority and low-income populations. More recently, environmental justice research has also evidenced the role environmental benefits have in promoting or demoting environmental justice (McIlvaine-Newsad, 2013). Boone et al (2009) used census data and a GIS radial method to measure distribution of and access to parks as an indicator of racial equity in Baltimore, Maryland. Boone found that a higher proportion of Blacks have access to more parks within walking distance (.25 miles) than Whites, and Whites have access to more park space per acre within walking distance than Blacks. They interpreted the present-day pattern of parks in Baltimore as an environmental justice issue because of the congestion of park space in Black neighborhoods and the inequality of park services between predominantly Black neighborhoods to predominantly White. Gottlieb (2005) described the environmental justice movement as one that re-conceptualizes urban space for parks and recreational activities, including community gardening and farmers' markets, for low-income populations. In their research of land use allotments in Europe, Ferris et al, (2001) found that the use of urban open spaces for parks and gardens is closely associated with environmental justice and equity. Gaither (2014) used census block group level data and found

that Latinos and those near or below poverty are, on average, underrepresented in communities within walking distance (.25 mile) of parkland while whites are overrepresented. One study used GIS methods to measure the accessibility and equity of public parks in Bryan, Texas and found equal access throughout all communities regardless of racial or income status (Nicholls, 2011).

Environmental justice research of either burdens or benefits commonly focuses on demographic studies using census level data. Rhodes (2002) found that differences between groups of people could be measured in regards to an indicator (proximity to environmental hazard/benefit) as a sign of environmental justice issues. In regards to unit of population demographic in environmental justice, Rhodes determined the most appropriate level of assessment across communities or neighborhoods to be the census tract or census block group. Census tracts are small, permanent statistical subdivisions of a county or equivalent entity that are updated by local participants prior to each decennial census; block groups are slightly smaller statistical divisions of census tracts which can be broken down further into census blocks, the smallest unit of census data. Census block groups contain between 600-3,000 people while census tracts contain between 1,200-8,000 (Census, 2014). Baber (2002), Noonan (2008) and Mohai, (2006) also found that census defined areas are most suitable for measuring environmental imbalances within a community.

An issue evidenced in past environmental justice research is how to appropriately define minority or low-income populations. Crowder et al (2010) evidenced the importance of including multiple racial/ethnic groups in environmental inequality research (Blacks, Hispanics, Pacific Islanders, Asian Americans, Native Americans and Whites) rather than focusing on a single minority population. In considering what defines a minority community Rhodes (2002) found it best to compare a communities demographic percentages with those of next largest areal unit to

determine minority or low-income status. For example income or racial percentages for a census tract within a city should be compared with the percentages for the entire city.

*Policy*

The following selected literature evidences the importance of government's role when considering environmental justice conditions of a city. Bullard (1990) believes that the government is often the cause of environmental injustice. He suggests that, "Government agencies and other responsible parties need to incorporate principles of environmental justice into their strategic planning of risk reduction (p. 21)" He also promotes the use of environmental justice policies that require a 'fair share' plan considering social demographic, economic and cultural factors of the affected communities. Bullard exemplifies New York City's adoption of 'fair share' legislation of 1990. This legislation made sure every community within the city bore an equal share of noxious facilities. Bellows (2014) also evidences the importance of local government in environmental justice, he finds them to be the main discriminative source as they have more domain over the issues and policy implementation, "local governments play a crucial role in distributing environmental harms and benefits—and all too often they disproportionately impose environmental burdens on low-income neighborhoods and neighborhoods of color (Bellows, 2014:1)." Konisky (2009) considered the crucial role of government in his research finding that although state governments cannot easily change preexisting geographical distribution of noxious facilities or the spatial patterns of pollution, they can address facility pollution that exceeds emission standards and higher levels of pollution in minority and low-income areas as a result of lax enforcement. Konisky notes the lack of federal control in environmental justice, which puts more power into the local and state government. Downey et al (2010) promoted the necessity of detailed, historical studies to illuminate the process of potential

environmental inequality formation. The consideration of local policies, including historical aspects and current residential choice, are likely to improve environmental justice research by creating more ground behind why environmental conditions are the way they are or why certain communities are found where they are.

## MATERIALS & METHODS

The structure of the current research study is based on Gaither's study of Hall County, Georgia (2014). The study found evidence of environmental justice issues by weighing the counties environmental benefits and environmental burdens together. The importance of using a multivariate system in an environmental justice analysis is also promoted by Rhodes (2002) who found no one method, or collection of methods, for measuring environmental justice issues exist, noting "since environmental justice covers such a wide variety of situations and conditions, one single methodology, however powerful, however complicated, can ever successfully assess it." In order to determine the extent to which environmental injustice occurs in Lincoln, Nebraska this study employs three variables that are frequently used in the literature to determine if environmental justice concerns exist: industrial toxic release facility sites, park space and city policies.

The first step will be to determine the distribution of environmental burdens throughout Lincoln. This requires the use of the EPA's Toxic Release Inventory data. The EPA requires large facilities (those with > 10 full-time employees) that manufacture or process more than 25,000 pounds of certain chemicals or use more than 10,000 pounds of a certain chemicals in a given year. In 2013 (latest available reporting year), the EPA required nineteen industrial facilities in Lincoln to report their toxic chemical releases. These nineteen were restricted further (down to nine) by only including sites that produce on-site releases of toxic chemicals. Other

types of release include off-site or transfer of certain chemicals but because those emissions cannot be tracked they are ineffectual for this study. Community composition of the areas surrounding the nine facilities with on-site releases will indicate whether a greater proportion of minority or low-income residents are located around environmental burdens in Lincoln. First, the location of each TRI facility is mapped using Enviromapper software (http://www.epa.gov/emefdata/em4ef.home). Then the populations living near by will be selected by drawing 1-mile radii around each facility. Other studies using the radius method to determine population demographics use various sizes of radii including .25, .5, 1 or 2 miles. But considering Lincoln's relatively small size 1-mile radii should give an accurate picture. Reports will be formulated using census information of the population located within the 1-mile buffer zone. Block group (basically neighborhood) level census data (2010 Census summary file 1 report) is the unit of analysis for this study. Because the 1-mile radius may include multiple census block groups Enviromapper software is able to pull data from multiple block groups. Racial minority percentages (all non-white residents) and per capita income (average income of all people >15 years old in census block group) of the surrounding populations are compared to the entire city of Lincoln's percentage minority (16.9%) and per capita income ($26,401). Environmental justice issues are evidenced when a majority of TRI facilities are located in areas with disproportionate numbers of minority (not-white residents) or low-income (avg. per capita income lower than Lincoln average) residents.

To determine if environmental benefits are an environmental injustice indicator in Lincoln the next step is to analyze the distribution and accessibility of Lincoln's public recreational park system. Lincoln Park's and Recreation Department manages 125 total parks with 83% of the population within ½ mile of a park (Long Range Planning, 2014). Of the 125

parks 111 total are mapped for this study (Enviromapper software). Parks that are not to be mapped include: undeveloped properties, dog runs, nature conservancies > 300 acres (Wilderness Park, Pioneers Park Nature Center), and gardens or plazas located in already included parks. Dog runs and conservancies were excluded because they are very large and are to be used by the entire city so proximal population calculations won't apply. To test the accessibility .25-mile radii will be drawn around every park. The quarter mile represents walking distance has become a standard threshold distance used in park accessibility studies in the U.S (Cutts, 2009). The total percent of residents within each quarter mile radius that are of minority status (non-white) will be computed. Those percentages will be averaged and compared to the total percent of minorities in all of Lincoln. If a smaller proportion of minority residents lies within the quarter mile distance evidences an environmental justice issue because minority residents will have less accessibility to public park spaces. Equal distribution of public parks will be analyzed by categorizing each park by the percentage minority and per capita income of the census block group area in which the park is located. After each park is categorized the total acres of parkland for each minority percent range (0-10%, 11-20%, 21-30%, 31-40%, 41-100%) and each per capita income range ($130-16,000, 16,001-26,000, 26,001-41,000, 41,001-72,000, and $72,000+) will be calculated. Total percentage of Lincoln's park acres will be determined for each minority percent range and each PCI range. These percentages will be compared to percent of Lincoln's total square miles within each range. If the percentages are close to each other this evidences equal distribution. Environmental justice issues are evidenced if a significantly difference exists between the percentages in low-income ranges ($130-$26,000) or high minority percentage ranges (>20%).

After running the demographic analysis surrounding Lincoln's environmental burdens and benefits an analysis of local policy is necessary to evaluate if Lincoln is promoting environmental justice or demoting it. Policies to be analyzed include important aspects that have been mentioned in past literature to have certain implications on a cities environmental equality. These include local ordinances, city planning documents, zoning regulations and historical land use/moving patterns. Relevant documents were obtained from the City of Lincoln planning department and will be reviewed for potential environmental justice implications or voids.

The final step will be to consider all three parts of my data collection: park space, TRI sites and the city policies together to determine if and where environmental justice issues are happening in Lincoln.

## RESULTS

In examining the Lincoln residents within close proximity (1-mile radius) of (TRI) facilities to all Lincoln residents it is found that 7/9 facilities are located in low-income areas (lower PCI then Lincoln's total: $26,000). And 4/9 facilities are located in areas with high percentages of minorities (>17%). A disproportionate amount of Lincoln's low-income residents are affected by the industrial facilities proximal location to their residence. Although some outliers do exist, a majority of Lincoln's TRI facilities are located in areas with lower than average (16.9%) amounts of minority residents. One of the outlier facilities has an alarming 33.05% minority population within its 1-mile boundary, which is almost two times greater than Lincoln's average. Seven facilities have low per capita income levels of about $20,000; two facilities are located in higher per capita income areas (>$26,000). The four facilities located in an area with higher than average amounts of minorities also have lower than average per capita

income populations. See Table 1 for a complete list of all facilities, the racial minority percentage and the per capita income of the surrounding population.

**TABLE 1: TRI INDUSTRIAL FACILITITES IN LINCOLN, NE**

| Facility Name | ADM | Nebraska Boiler | Veyance Technologies Inc. | Schneider Electric USA | Lester Electrical | Lincoln Industries Inc. | Tri-Con Industries | Kawasaki Motors Manufacturing Corp. USA | Molex Inc. |
|---|---|---|---|---|---|---|---|---|---|
| **Percent Minority of Total Population within 1-mile** | 13.05 | 12.88 | 13.57 | 15.73 | 29.63 | 33.05 | 23.20 | 10.62 | 21.04 |
| **Per Capita Income of Population within 1-mile** | $20, 737 | $19, 637 | $20, 870 | $31, 192 | $20,758 | $18, 902 | $19,534 | $27, 770 | $20, 573 |

Table 1 shows all Lincoln facilities that report >0 lbs of on-site toxic releases. Based on 2010 Census data.

Out of Lincoln's 125 public park spaces 111 were mapped for this study. The parks that weren't mapped were undeveloped; conservancies larger than 300 acres, dog runs, and gardens or plazas located in already mapped parks. In regards to equality of park access, out every Lincoln resident that lives within walking distance of a city park 18.19% are non-white minorities. Compared to the total percent of minority population in the Lincoln area (16.9%) the percent of minority residents with easy accessibility to a park is higher. In fact every racial category, excluding Asian/pacific Islander and white, is represented in a higher proportion in the population within walking distance of a park than in the total Lincoln population. See Table 2 for a breakdown by racial category of the total Lincoln population living within walking distance of

a park.

**Table 2: Percent of Population By Park and Percent of Total Lincoln Population**

| Racial Category | % of total population living within .25 mile of a public park | % of total Lincoln population |
|---|---|---|
| White | 81.21 | 83.11 |
| African American | 4.36 | 3.70 |
| Hispanic | 7.34 | 6.26 |
| Asian/Pacific Islander | 3.55 | 3.81 |
| Multi-Racial | 2.66 | 2.37 |
| Other | .9 | .76 |

Table 2: Shows the percents by racial category of Lincoln's population living within walking distance .25 mile of a public park facility and racial category percents of total Lincoln population.

Next the distribution of public parks was determined. Of the 111 parks used in this study 5 were > 100 acres and not included in the distributional analysis. Because of their size they were covering more than one census block group area and couldn't be categorized. First census block areas of Lincoln were classified by per capita income amount. Low-income ranges are those with incomes lower than total PCI of Lincoln ($26,100) and high-income ranges are those with incomes higher than total PCI of Lincoln. The majority of Lincoln's square miles (50.9%) are located in higher per capita income ranges ($26,001-$72,000). See Table 3 for a breakdown of percentages by per capita income range. However when percentages of total park acres by PCI range are calculated the majority of Lincoln parkland acres are located in the low-income ranges ($130-$26,000). With 712.32 acres low-income ranges contain holds 70.6% of Lincoln's parkland. The higher per capita income ranges have 296.69 acres and 29.4% of Lincoln's parkland. Unequal distribution is evidenced as percents of park acres are compared to percents of Lincoln's total square miles. The lower per capita income ranges have significantly greater distribution of park acres.

**Table 3: Distribution of Parks by Per Capita Income Ranges**

| Per Capita Income Range | Percent of Park Acres | Percent of Lincoln Area |
|---|---|---|
| $130-$16,000 | 19.37 | 16.07 |
| $16,001-$26,000 | 51.19 | 24.05 |
| $26,000-$41,000 | 21.26 | 35.46 |
| $41,001-$72,000 | 8.17 | 15.41 |
| $72,000+ | 0 | 9.01 |

Table 3 shows total percent of park acres and total percent of Lincoln area covered by each per capita income range. Percentages were calculated using Enviromapper software.

The percent minority of their total population classifies next census block areas. Census blocks with 0-20% of the population being non-white minority encompass 71.8% of Lincoln. While census blocks with 20-100% of the population being non-white minority encompass 28.1% of Lincoln. The census blocks with 20-100% of population being non-white minority evidence areas with high amounts of minority residents. Areas with low or average amounts of minority residents are evidenced in the census blocks with 0-20% of population being non-white minority. This is due to Lincoln's average non-white minority percent of 16.9%. The census blocks with low/average amounts of minority residents contain 785.93 acres or 77.9% of Lincoln's total park acres. The census blocks with high amounts of minority residents contain 223.38 acres or 22.1% of Lincoln's total park acres. Comparing the percent of park acres to the percent of total Lincoln area evidence is found that there is equal distribution throughout various minority ranges. See Table 4 for a complete list of percentages by minority ranges.

**Table 4: Distribution of Parks by Minority Percentage Ranges**

| Percent of Minorities Within Total Population Range | Percent of Park Acres | Percent of Lincoln Area |
|---|---|---|
| 0-10% | 30.2 | 13.38 |
| 11-20% | 47.67 | 58.43 |
| 21-30% | 13.73 | 20.04 |
| 31-40% | 5.51 | 6.03 |
| 41-100% | 2.88 | 2.12 |

Table 4 shows total percent of park acres and total percent of Lincoln area covered by each minority percentage range.

The policy review started with reviewing Lincoln's local ordinances. One ordinance that was found to have environmental justice implications was Lincoln's implementation plan of the federal Title VI regulations. Lincoln's Civil Rights plan assures that every effort will be made to ensure nondiscrimination in all of its programs or activities, whether those programs are federally funded or not. In addition Lincoln city government has a commission on human rights to develop an inclusive and supportive city climate that avoids discrimination through any means including environmental. Through an examination of zoning ordinances there is no evidence found of discriminatory industrial placement by the city. Lincoln has strict zoning ordinances with two industrial districts one of large industry (I-2) and one of small industry placement (I-1). However in some of Lincoln's older neighborhoods small industrial zoning is often side-by-side to residential zoning with minimal setback distances and some residences are even located within the zoning district. From about 1860-1930 the railroad influenced the settlement of many of Lincolns first citizens and creation of Lincoln's first industrial sectors. Today industry still remains around the railroad and the interstate, as do many of Lincoln's oldest and thus least expensive housing options. Lincoln started very central and has grown outward in all directions. Looking at moving patterns in 1980's and 1990's it is evidenced that Lincoln's first neighborhood settlements were loosing people by the hundreds as new residential tracts were gaining population by the hundreds. This helps evidence that any environmental inequalities found in Lincoln are not cases of overt discrimination but rather involve housing markets and unequal pricing based on historical factors which influence low-income and often times minority residents into those locations.

Next Lincoln's long-range comprehensive plans from 1994, 2002 and 2011 were reviewed. These plans assess current conditions and, according to the planning department,

"outline where, how and when the community intends to grow, how to preserve and enhance the things that make it special, and get strategies for implementing the vision for how we will live, work, play and get around in the future" (Long Range Planning, 2014). These documents are vital when evaluating a cities consideration of its minority and low-income populations and show how and why a city's built environment (i.e. industry and parks) is the way it is. The first plan was in 1994 which at that time and still today Lincoln has seven industrial parks with 2,431 acres of industrial ground and all but one industrial site are located north of O street. In this plan it was a goal to coordinate with Lincoln Public Schools to develop joint park facilities. This is important to this study because it evidences why many of Lincoln's current parks are located where they are (adjacent to public school facilities).

One aspect of environmental justice being met within cities is equal opportunities for public participation. In the 1994 plan the city made it a goal to "uphold the public trust by being aware of and responsive to the recreation needs and desires of the citizens of Lincoln through a departmental program of citizen participation." This goal was a major focus of the 2011 plan as a public involvement and engagement effort was developed. This effort included contacting several community organizations to more fully engage traditionally under-represented populations (minorities and low-income households), printing flyers and newsletters in multiple languages, mailing neighborhood associations, notifying surrounding property owners of development applications, free internet access on an on-going basis at public libraries and a planning assessment survey to attain public opinion. The 2011 plan includes an environmental justice action strategy to implement an environmental justice agenda into the cities comprehensive plan. Lincoln's EJ strategy includes background principles, population definitions, target populations, and an EJ participation process.

Multiple Lincoln housing patterns are pointed out in the plans that have connections to environmental equity concerns. First, lowest home ownership rates are in Lincoln's central neighborhoods and this fact was true in both the 2002 and 1994 plans. In the 2011 plan the city made one of its goal to make housing ownership possible for all of Lincoln's citizens by focusing on lowering housing costs throughout the city. Another pattern is how areas of higher population densities are concentrated near downtown and in Lincoln's older neighborhoods. Areas with newer neighborhoods have population densities below average level. This leads to one of Lincoln's goals to "distribute and preserve affordable housing throughout the community to be near job opportunities and to provide housing choices within existing and developing neighborhoods." The City understands the lack of choice low-income and minority residents have when choosing where to live and the environmental implications behind this lack of choice. The 2002 plan had a goal focused towards public parks to identify opportunities to acquire and develop neighborhood parks in established neighborhoods that are deficient in neighborhood park resources. This shows the planning department isn't just focused on Lincoln's newer residential zones when it comes to location decisions. The 2011 plan outlines the future of the city until 2040. Several initiatives within the plan show the city is focused on concerns of environmental equality. This includes the new mixed use community form proposed by the department, which will focus on having commercial, retail, single-family houses and multi-family facilities in the same area. This mixed-use community shows positive environmental justice implications in where future Lincoln is headed. By integrating a variety of housing types and commercial services in one area these communities are able to "serve a variety of income levels and allow people to live, work and shop within walking and biking distance." These communities show a step in the right direction for Lincoln's environmental policies as they open

up other areas for low-income residents to live and work. The plan also recognizes Lincoln's growing minority population and embraces the trend as the plan's policies and programs are implemented. Overall the review of Lincoln's policies evidenced an environmentally just city. Although historic settlement and moving patterns have concentrated Lincoln's low-income and minority populations in centrally located old neighborhoods, current planning initiatives are recognizing the growing minority and poor populations and focusing efforts on equal housing and environmental conditions.

## DISCUSSION

In this exploratory study three variables: industrial sites, park space and policy are considered when assessing if environmental justice issues exist in Lincoln, NE. For this study a low-income population was determined to exist if the populations per capita income (PCI, every person in populations reported income divided by total number of persons) fell into the lower half of the census per capita income divisions which are as follows: $130-16,000, $16,001-26,000, $26,001-41,000, $41,001-72,000 and $72,000 +. Using census measures to determine low-income status is a research technique used in past environmental justice studies which compare census block group level data to census tract or city level data (Pastor 2001, Downey et al. 2009). Census data for 2010 shows Lincoln's average per capita income to be $26,188, which lies in one of the higher categories. For each of the TRI facilities if the per capita income of the census block group in which it lies is in one of the two lowest per capita income categories it is considered to be in a low-income area of Lincoln. As the results show seven out of nine total TRI facilities are located in low-income areas and this evidences an environmental justice issue of Lincoln's low-income population facing greater environmental burdens than residents living in medium to high-income block groups.

Common research on industry siting in the environmental justice discourse focuses in on an area with a greater minority percent than white percent >50% and studies the environmental conditions that exist in those areas. This was not possible for this study because there are no TRI facilities located in census block groups of Lincoln with 40-100% minority residents. This is mostly due to the overall small amount of census block groups that have 40-100% minority residents but still evidences positive implications towards Lincoln's environmental justice conditions. For this study the populations within 1-mile of Lincoln facilities were tested for higher amounts located within those buffers being an indication of environmental injustice. A higher amount of minority residents meant that the percent of minority within 1-mile of facility was higher than Lincoln's total minority percent at 16.9%. The results show that four out of nine TRI facilities are located in areas of Lincoln with higher than average minority residents. In this study we consider the total distribution and because a majority of facilities are not located in areas with higher than average minority residents it is evidenced that minorities do not face greater environmental burdens than do Lincoln's white residents.

Next I consider the environmental justice implications the study findings have regarding park distribution and access as an indicator of environmental benefits. The equality of access mapping technique was used in Boone (2009) and Gaither (2014) who studied the population within walking distance of a park. Boone found that blacks were over represented in areas within walking distance of a park compared to areas not within the walking distance buffer. This study agrees with the literature and found that when the percent of minority populations within walking distance are compared to percent of minority population in all of Lincoln the proportions are higher in areas within walking distance for a majority of racial categories excluding whites and Asian/Pacific Islander. This finding evidences that access to parks is not an environmental justice

issue because actually a greater proportion of minorities live within walking distance then live in other areas of the city. The analysis of parkland distribution found inequalities between differing income status census block group categories. With distributional analysis it is necessary to relate the percent of parkland in each category to the total percent of land covered by the category in Lincoln. This evidences the opposite of what has been found in environmental justice studies and finds that more parks per acre are found in low-income neighborhoods then in high-income neighborhoods considering the total amount of space they encompass in Lincoln. The same comparisons need to be completed for the census block groups based on minority percentage within the census block group. When these percentages are compared you can see that the total park acreage in each category is within 5% of the total amount of Lincoln's population falling into each category. A majority of Lincoln's population is categorized into the 11-20% minority population range and just under a majority of Lincoln's parkland is in this range as well with 47.67%. Distribution of environmental benefits, evaluated by park acreage, is evidenced not to be an environmental justice issue in Lincoln. There were 5 parks that weren't included in the categorization by census block group type because these parks were larger than 100 acres and are meant for regions or entire communities and not just the one census block group closest to them. Excluding them from the study doesn't diminish the results because these parks are regional and not only used by people within the census block they use.

Overall Lincoln's political initiatives show the cities awareness of environmental justice concepts and promote equality. Environmental justice concepts are evidenced by Lincoln's public engagement initiatives, environmental justice strategy, mixed-use community form future and consideration of the growing minority population in its long-range comprehensive plans. Although demographic analysis around environmental burdens and benefits can indicate

environmental justice issues so can unjust policies. One major aspect of environmentally just policy is one that allows for full public participation in regards to any change in environmental condition and Lincoln does a great job at this. The fact that Lincoln has an environmental justice strategy is vital in consideration of it's net environmental equity alone because although environmental justice is mostly a federal initiative and the fact that Lincoln has taken the time to consider environmental justice in its transportation and comprehensive planning initiatives shows the city is focused on dismantling any forms of environmental discrimination.

## CONCLUSION

In conclusion, environmental justice issues are found in Lincoln with regards to the unequal distribution of environmental burdens, TRI industrial facilities, in low-income areas. 78% of Lincoln's industrial facilities are located in low-income areas. No environmental justice issues are evidenced against Lincoln's minority populations regarding distribution of Lincoln's TRI facilities. Environmental benefits (public parks) do not evidence environmental justice issues. Accessibility to public park space is proportional for most racial minority categories. Park distribution by acres is proportionally equal for all differing minority percentage categories. While significant discrepancies exist between low-income and high-income areas, this does not evidence an environmental justice issue as low-income areas have a far greater amount of park acres. Keeping the results of the demographic analysis in mind we analyzed the effect Lincoln policy has on the environmental equality of the city and found that Lincoln's zoning ordinances and planning documents act to promote environmental equality and high amounts of public involvement. When considering all three variables and Lincoln's net environmental equity our study found Lincoln to have net environmental equity. Further studies should look into other indicators of environmental burdens in Lincoln other than TRI facilities. This study used facility self reported toxic pollution in pounds but the actual impact on the surrounding populations due

to the facilities releases was not considered in the findings. Further studies could find other evidences of air pollution in Lincoln. This study evidenced that Lincoln's minority population do not face greater environmental burdens but this is based on one indicator and further studies might not find the same results using a different indicator. This study found no reasons as to why Asian/ Pacific Islanders and white populations are less represented within walking distance of parks and that could initiate further research into why this is an occurrence. Further research could search for reasoning into why discrepancies exist between Lincoln's high-income and low-income census block groups and what if anything can be done to make them equal. This study used distributional analysis but future research will involve considerations of housing markets, residential choice and moving patterns to determine whether the distributional discrepancies are environmental justice issues or a matter of choice. Environmental justice is a complicated discipline and drawing conclusions about an entire city based on demographic calculations and policy review adds to the exploratory environmental justice research discipline.

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